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ABSTRACT

This paper reviews the current extent of, research into, and future expectations for the use of online bibliographic retrieval systems by untrained end users rather than by trained search intermediaries. Six sections cover: (1) studies of direct end user searching, done primarily with students or persons in highly technical fields; (2) problems to be addressed before end user access can become common practice, including the variability of search procedures and the user's possible lack of computer, online searching, and information seeking experience; (3) suggested solutions to these problems, including standardization of online search procedures, training of end users, and the development of user-friendly system modifications; (4) methods and systems currently used to train novice online users, including TRAINER, DIATOM, and IIDA (Individualized Instruction for Data Access); (5) current research into user-friendly system modifications, with descriptions of VSS (Vocabulary Switching System), CONIT (Connector for Networked Information Transfer), IIDA, TSW (The Searcher's Workbench), PaperChase, MICROsearch, CITE (Current Information Transfer in English), and OL'SAM (Online Search Assistance Machine); and (6) projections concerning the future direct use of computer information systems. A 54-item bibliography is provided as well as a 38-item annotated bibliography of ERIC publications and information on how to order ERIC documents. (ESR)

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THE DIRECT USE OF ONLINE BIBLIOGRAPHIC INFORMATION SYSTEMS BY UNTRAINED END USERS: A REVIEW OF RESEARCH

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THE DIRECT USE OF ONLINE BIBLIOGRAPHIC INFORMATION
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September 1983



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TABLE OF CONTENTS

Introduction	1
Studies of ERIC	2
Problems	3
Solutions	5
Education of Users	6
System Modifications	8
Future Directions	14
References	19
ERIC Bibliography	25
How to Order ERIC Documents	39

THE FUTURE

There are two types of systems that will be available to end users with the advent of direct interaction with online information systems. What was once available only to experts, namely, for researchers and subject specialists is becoming available to lay persons. It is therefore highly appropriate to take a look at online information systems in the light of direct interaction with "naive" or "naïve" users. This paper is critical in the area of bibliographic retrieval systems by critical evaluation—the present state, research efforts, and what we might expect in the near future.

"An information retrieval system is one in which a user (via a computer) directly interrogate a machine-readable database of documents or document representations" (28). Online bibliographic systems, analogous to non-mechanized indexes, are access tools directing the user to appropriate sources by providing citations, and in many cases, short descriptions (i.e., abstracts) of documents. Bibliographic systems do not provide the user with the contents of documents as do knowledge-based (also called full-text or expert) systems. Full-text is a major consideration in future online information provision, but beyond the scope of this paper.

End users are those who will actually be using the information, not necessarily the persons who conduct the search online. Untrained end users may be subject experts, but they may not have the familiarity, training and skills presently associated with searching and retrieving information from computerized systems. Currently, the direct use of online retrieval systems is primarily performed by trained search experts. End users supply questions and interact with professional online searchers who formulate strategies and then search appropriate online databases. It is the expert intermediary who directly uses the online system.

Many predict that this situation will change and that "end users' of information systems (library patrons, students, etc.) will input their requests and receive output without the assistance of a trained intermediary... (and that) ...an important application problem for the 1980's will be the adaptation of on-line computing and micro-computing to the information tasks of everyday life" (37). The browser who is unclear as to exactly what he is seeking, the student working his or her way through a particular subject area, and the

of the university environment. The university environment is not limited to research and teaching. The university also has a social and cultural context that is different from other environments. The university environment is a complex and dynamic environment with a number of settings and contexts that affect the behavior of students. The university environment is a complex and dynamic environment with a number of settings and contexts that affect the behavior of students. The university environment is a complex and dynamic environment with a number of settings and contexts that affect the behavior of students.

STUDIES OF NOVICE USERS

The majority of research studies concentrating on novice end-user searching have involved college students (undergraduate and graduate) or persons in a given time-based field. Fennell's study (14), perhaps the most extensive, sought to identify differences among searchers (1) of varying amounts of overall experience (including none), and (2) with or without experience on the particular data base being searched. Using students in an introductory library and information science class, she found that "compared to the experienced subjects, beginning searchers performed surprisingly well," particularly as measured by precision (an indication of accuracy obtained by dividing the number of relevant references retrieved by the total number of references retrieved) (14, p.23).

It was clear that novices did search more slowly and make more errors than experienced searchers. In addition, experienced searchers performed higher on a recall measure (an indication of comprehensiveness derived by dividing relevant references retrieved by the total number of relevant references in the data base) and unit cost (a measure of cost-efficiency derived by dividing connect time by the number of relevant references retrieved). Fennell's results do confirm that for a straightforward topic, untrained users can successfully access an online database and retrieve relevant documents. As searches become more complex and/or comprehensive, the advantages of utilizing a skilled professional are more apparent.

The university environment, not unexpectedly, has provided subjects for other studies. Lowry (26) found novice information retrieval students performed better with full-semester training vs. a short training seminar. Brooks (4) found upper division and graduate students in the biological sciences enthusiastic and capable after a

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the user's knowledge of the system and the system's knowledge of the user. The system's knowledge of the user is extended by the user's knowledge of the system. The user's knowledge of the system is extended by the system's knowledge of the user. The system's knowledge of the user is extended by the user's knowledge of the system. The user's knowledge of the system is extended by the system's knowledge of the user.

The DIATOM simulator, developed at Syracuse University, is a computerized database that provides a simulated environment for understanding and testing services, techniques, and procedures. It is designed to provide a simulated environment for understanding and testing services, techniques, and procedures. It is designed to provide a simulated environment for understanding and testing services, techniques, and procedures. It is designed to provide a simulated environment for understanding and testing services, techniques, and procedures.

Another example of a simulated environment for understanding and testing services, techniques, and procedures is the TRAINER program, developed at the University of Pittsburgh. The TRAINER program is designed to provide a simulated environment for understanding and testing services, techniques, and procedures. It is designed to provide a simulated environment for understanding and testing services, techniques, and procedures. It is designed to provide a simulated environment for understanding and testing services, techniques, and procedures. It is designed to provide a simulated environment for understanding and testing services, techniques, and procedures.

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Meadow's IIDA (Individualized Instruction for Data Access) project is committed to the objective of enabling "end users of bibliographic information to perform their own searches under certain circumstances" (39, p.326). Operating as an intermediary between the end user and the online system, IIDA has both online assistance and pre-use training capabilities.

the instructional mode. The IIJA consists of two teaching exercises, using a simplified form of computer-assisted instruction, interspersed with actual searches. Topics covered include basic commands, advanced commands, text searching, search strategy, database descriptions, beginning and ending the search, and IIJA tutorials (36, p.327-32). The role of the instructional mode is integrally tied to the overall IIJA package (described in detail below), and unlike TRAINER, does not include instruction in telecommunications and access procedures.

Studies of the relative effectiveness of any particular training technology have been generally inconclusive. In addition to the computer-assisted packages described above (see also Filley (49)), methods range from written training aids such as those developed for SCORPIO, the Library of Congress retrieval system (46), to a combination of instructional sessions, worksheets, and lab exercises (3, 4, 12, 17, 26). Each of these approaches has met with a degree of success; however, it is not possible to make definitive statements about the value of one vs. another. Even in a situation where training was minimal (Tietelbaum and Sewell's survey of pathologists and pharmacists), over half of the respondents felt their searching ability to be competent (48, p.300). It is questionable whether more specific investigation to determine those methods that are truly more effective (as well as economical) can ever yield conclusive results. For more discussion on education and training efforts, refer to Bourne and Robinson's comprehensive review through 1980 (3).

SYSTEM MODIFICATIONS

The alternative to raising the level of end user ability is to somehow make the system itself more capable and "user-friendly." In their work for the National Library of Medicine (NLM), Goldstein and Ford (16) utilized an "intelligent terminal" (a computer with a microprocessor physically incorporated into the terminal) to make the system more "user- cordial" rather than having the user "conform to rigid protocols and learn special codes." Selander pointed out that system designers need to consider (1) user objectives, (2) current procedures, (3) tutorial aids, (4) system organization, and (5) machine intelligence in order to improve system cordiality (43, p.66). The overall objective should be to provide users with a system which is

of the system. The system is designed to be used by a single user at a time. The system is designed to be used by a single user at a time. The system is designed to be used by a single user at a time.

Believing that the information user, the differences in indexing and retrieval policies, and indexing policies are the major obstacles to more intelligent and more effective use of online services, Nicloft devised the Vocabulary Switching System (VSS), an automated subject switching system "able to translate user requests into useful search queries across target databases with little user intervention" (32, p.397). Nicloft reports that while initial evaluation results for VSS were encouraging, but inconclusive, they did support the assertions that no single database is authoritatively sufficient, and significantly higher recall is possible when one searches multiple databases.

Martus and Reimies (33) also focused on the problems generated by multiple and complex online retrieval systems. They proposed a solution which involved the accessing of online utilities and data bases through a computer interface (CONIT) designed to handle both access and vocabulary problems. "The interface is . . . a common system into which and from which requests and results are translated automatically as they flow between user and serving system. . . . A user attempting to retrieve information, when entering through the access mechanism provided by the common interface, sees a single virtual system in which all the complexities of the different retrieval systems and databases are hidden: only a single, uniform, easy-to-use system is apparent" (28, p.288).

The CONIT system handles different existing, stand-alone online data base systems without modification and replaces existing, difficult-to-use heterogeneous interfaces with a simpler, easier-to-use interface. In addition to the controlled-vocabulary search mechanisms of existing systems, CONIT also provides a natural-language, keyword-stem approach for searching. This allows the searcher to enter any term (word or phrase in free-form English), not just those included in a special, restricted vocabulary. The system modifies the entry by using only key words from a phrase and word stems rather than full words. Natural language searching is one response to the problems associated with the multiplicity of vocabularies, structures, and search functions of individual data bases and retrieval systems.

the user's problem. Since the model is not a heuristic, it is not possible that a single model could select the user's problem and generate a suggested solution with the intent to retrieve the exact solution from a network of heterogeneous systems in a reasonable time. The project also provided strong evidence for the hypothesis stated early that search strategies for a particular user could be suggested and adapted for the user's requirements. A final conclusion about a keyword-based approach to search is that structured information is an effective approach (28, p. 341).

The IDA project (31) does not address the problems associated with heterogeneous systems, attempting instead to improve user interaction with a single computer system. Here the system acts as an "intelligent assistant" or "computer coach" monitoring and appraising the search, evaluating both commands and responses, looking for errors or indicating cost problems.

Because each user is unique, IDA cannot prescribe how a particular search should be conducted. However, since it does have information about correct syntax, about searches in general, and what has been the history of the current search, IDA can react by offering suggestions on how to proceed in the context of the error or problem encountered. IDA employs a set of diagnostic procedures, and when a problem is detected can "(1) inform the user of the nature of the problem, (2) offer advice on what to do next, and (3) offer a reminder of what reference information is available concerning this specific problem" (30, p.327-330). In addition, the system has an extensive HELP facility allowing the user to request quick advice, a search summary, more detailed information, or the option of changing IDA modes (e.g., from assistance back to instruction). IDA currently runs on the MIT MULTICS computer system and CONIT software (described above); however, it could be adequately handled by a minicomputer such as Digital's PDP-11 (29, p.58).

Preece and Williams (36) have proposed a microcomputer-based intelligent terminal able to offer uniform access to multiple data bases with many of the desirable features previously described. "The Searcher's Workbench" (TSW) is designed to make the user unaware of the operational differences among online systems and data bases (i.e., the differences are unseen or "transparent" to the user), offering instead a single, uniform front-end (the part of the online system with which the user interacts) for online searching. Central to TSW is the definition of a "model search system." User input is analyzed in terms of the pre-defined model and then altered to the specific

although the particular details of the search systems and variations of controlled vocabularies that are handled by modifications to the model. In addition, search aids are incorporated into the model offering the user direct access to search-enhancing and tutorial aids.

TSW was clearly designed from a user's perspective. Users are presented with a single, simplified system bolstered with assistance capabilities; however, experienced users are able to bypass the structured system and conduct standard boolean searching on multiple data bases. Users are also afforded the advantages of touch panel input. For most procedures, rather than entering commands and responses by typing on the keyboard, they can simply touch indicated areas of the screen.

To date only a prototype TSW (PTSW) has been built. This comprises a loose configuration of hardware devices, not just one piece of equipment. A production-model TSW (with the same goal of "implementation of access to diverse search systems through user interaction with an ideal model search system") would be a single unit or a cluster of terminals sharing a central processor (35, p.404). Proctor and Williams also foresee the possibility of a TSW operational software package adaptable to many popular microcomputers being available commercially in the near future.

Similar to HIDA and TSW in providing online search assistance is PaperChase, mentioned earlier. PaperChase has the capability for monitoring the search in order to make recommendations for improvements, usually by suggesting (additional) search terms. Since the available database is a subset of the MEDLINE data base, the use of a MeSH term (i.e., a term from the controlled medical subject heading vocabulary) can greatly enhance chances for success. The program encourages the user to type whatever seems appropriate, removes blanks and punctuation, and attempts to match input to MeSH terms and rotated versions of MeSH terms. In this way the system presents alternative search terms which the user can utilize. PaperChase also provides online help facilities, sorted display (most recent items appearing first), and sorted output (listed in the order that journals are shelved in the hospital library) (19).

A project which also relies on a subset from the tapes of a large data base is MICROsearch, developed by Bruce Clark at the ERIC Clearinghouse on Information Resources, Syracuse University (8). Directly aimed at the audience of non-professional searchers,

microcomputers, such as the Apple II series with one disk drive). Searches formulated directly from the ERIC database are transferred by a process called "disk loading" to the 5 1/4 inch diskettes used by the Apple system. The user, possibly a school librarian, teacher, or other staff member, is not permitted to connect to any commercial data bases, such as the database and MicroResearch software are both provided on the "library" diskette. Another key component of the project is the user interface. The formatted screen (with certain data elements appearing on display) is designed to simplify the operation of the system, and to guide the user through the search.

The major difficulty in providing stand-alone databases on a small microcomputer system is the limited storage provided by the 5 1/4 inch diskette. There is only room for between 200 and 300 records per disk, and when a particular subset of ERIC required using many diskettes, users were frustrated by the failure to retrieve anything on disk after disk. One approach to overcome this has been the move to store related sets of disks rather than simply dividing them into sets chronologically. Another attempt to compensate for the limited storage space is the RE-EXECUTE feature whereby the RX command allows for automatic "re-execution" of previously used search terms (along with associated logical operators) on multiple disks. As diskette storage capacity increases and as more sites acquire hard disk drives, the overall problem should diminish.

Current efforts involving MICROsearch include working on the space problem, refining the programming, and making the system available for other microcomputers. In addition, field testing uncovered two needs: (1) the ability to create local files that can be searched with MICROsearch, and (2) an interface designed to facilitate learning to search which can adapt as the user grows in sophistication (i.e., as the user is able to exercise more control, the interface does less). The local files capability is already available and design of the interface is underway.

The promising research efforts described above have been aimed primarily at providing a means of educating and/or assisting the user in maximizing the benefit obtainable from existing boolean systems. Acknowledged, but not confronted, is the question of what would happen if the boolean mechanism itself were replaced. Salton (41, 42), van Rijsbergen (51), Sparck-Jones (45, 46), Oddy (33), Preece (35), Kraft (24), and others (2, 39, 40) have been investigating search

other extensions of the traditional search model have allowed presentation of various schemes of clustering, vector space weighting, probabilistic indexing, relevance feedback, and other mechanisms have been studied and found to perform with varying degrees of success in simulation laboratory settings.* A major difficulty in assessing the full performance of a given approach (even as measured by recall and precision) has been the problem of experimenting in a "natural" environment, i.e., using actual searches conducted in operational systems (e.g., DIALOG, SDC, BRS).

One such type system which does demonstrate the possibility of natural language search is a software for an operational data base--the National Library of Medicine's MEDLINE--IS CITE (Current Information Transfer in English). Developed by Doszkoos, CITE offers natural language query capability along with weighted and ranked output, relevance feedback, and automatic query modification.

Natural language allows the user to enter search items in free-form language, rather than being limited to a special command syntax and search variables. Document citations retrieved are weighted by the "number of query terms shared by a given citation and the relative frequency of such terms in the MEDLINE file" (11, p.135). The entries are displayed in decreasing order of importance as determined by the weighting. Through relevance feedback, the CITE user is able to offer a judgement as to actual importance, thereby refining the search, since modifications of the search query are made by the system based upon the characteristics of the

*Clustering refers to a mathematical process whereby documents are grouped together as members of clusters. Vector spaces, a concept from linear algebra, can be used for representing distances (i.e., closeness) among documents in a collection. Weighting is the practice of assigning weights to search terms to indicate their importance. Probabilistic indexing uses a measure of term importance to indicate the likelihood that a term should be assigned to a given document. The probability measures can be used as term weights and documents can then be retrieved in rank order according to the probability of relevance to a given query (42, p.422). Relevance feedback takes user reactions to documents (relevance judgements) and returns them to the search mechanism in order to improve retrieval.

approaches. These have been in terms of (1) reducing the training time for students to employ existing interfaces and (2) developing the new system designs (e.g., enhanced search capabilities and alternative search mechanisms) have been utilized by focusing on various experimental systems. While no single effort has provided a comprehensive assessment of results, a great many useful areas are being investigated in experimental study.

In the future, a number of systems (database management, full-text, and expert) as well as bibliographic) will be employed by end users to meet information needs. To this end, interaction must be flexible and "iteration IV"—a goal already adopted by many concerned with the development of these systems. Researchers in information retrieval must continue to build on the efforts described in this paper as well as to expand their concerns beyond bibliographic systems.

The experimental work with intelligent interfaces has shown the feasibility and effectiveness of utilizing a computer as intermediary. Research on users (i.e., cognitive models, search strategy, and query formulation) and machines (e.g., artificial intelligence and memory capabilities) is needed to provide a basis and guidance for development. Further design and testing of specific systems is warranted to fully explore the capabilities of intelligent terminals, alternative hardware/software combinations, the impact of changes in interface design, and the effectiveness of certain features with specific user groups.

Future efforts to make online systems more accessible to occasional users must take into account the potential for applying results from artificial intelligence research. "Artificial intelligence (AI) is a branch of computer science which attempts to develop programs to enable computer systems to communicate fluently, to explain why they have taken certain actions, to handle unforeseen situations, and to exhibit other similar signs of intelligent behavior" (Sandewall; in 44, p.384). Application of AI techniques for pattern recognition, representation, problem solving, and learning can help in making system languages easy for the user to understand, and in creating systems which relieve users of unnecessary chore; (44, p.385). While acknowledging the progress represented by IIDA and CITE, Smith makes a strong case for employing artificial intelligence techniques in these efforts and in future designs.

development of intelligent systems. The research community has begun to focus on the development of intelligent systems that can assist in the search process. Both IIAV and ISW have been successful in this regard, demonstrating the potential of intelligent systems in the search process. However, some model systems have been developed that are not based on the traditional model of intelligent systems. These systems are based on the concept of intelligent systems as a collection of modules that can be used to solve a problem. This approach has been used in the development of the IIAV and ISW systems. A particularly interesting question is the relative effectiveness of different search techniques. For instance, IIAV has been found to be more effective than ISW in some cases. This question has been addressed in a number of studies, and the results have been mixed. Some studies have found that IIAV is more effective than ISW, while others have found that ISW is more effective than IIAV.

The creation of intelligent systems for experimental systems offers a range of advantages, and intelligent features should carefully address and provide options for users with varying levels of sophistication. One of the early ventures into this area, the Lincoln Institute's OLSAM (Online Search Assistance Machine) (59) is a non-on-line, non-computer-based, front-end processor related to the CONIT and IIAV projects. OLSAM offers a variety of assistance (e.g., auto logon, help paragraphs, prompting) and administrative features (e.g., a single command language, searches referred on disk, and administrative log) as a software package for the North Star Horizon II. Although the differences and changing nature of most systems have caused some problems, OLSAM demonstrates the viability of a commercial product and others can be expected to follow.

The microcomputer-based, self-contained system demonstrated by Clark's MICROsearch offers a locally controlled online capability that should increase in appeal. Whether using downloaded subsets of large databases or locally created files, MICROsearch offers real online information opportunities for non-professional searchers. System usefulness will grow with more widespread use of larger memory devices and increasing capacity of existing storage structures. The work on an adaptable interface, effective for users with varying amounts of experience and sophistication, has widespread application in the development of systems and training of searchers.

The research efforts using an intelligent terminal to investigate alternatives to boolean or modified boolean search mechanisms (e.g.,

various researches have been conducted to investigate the effectiveness of the system. Jameson and Oday, also mentioned the need for investigation of the ability to test alternative mechanisms in data settings. It is difficult to make definitive statements about performance.

Regarding the training of end users, studies of various instructional approaches have found each to be useful in improving performance. Online tutorials, manuals and handouts, formal instruction and workshops, and even just trial and error, all appear to be reasonable techniques. Although study in this area is likely to continue, it is doubtful whether definitive, comparative results are possible.

And, finally, studies of untrained end users must expand beyond undergraduate students, graduate students, and persons only in highly specialized areas. As database services expand to include more sources of interest to the general public, the full range of potential users must be taken into account. While journals have reported on the popular use of online information services (mostly commercial information utilities, e.g., The Source, Dow Jones, CompuServe, BRS After Dark, DIALOG's Knowledge Index) by home computer enthusiasts, little has been done to formally analyze this group or other more "general" direct users.

Even high school students are beginning to interact with online systems, e.g., the availability of the Guidance Information Service (GIS) in many secondary schools. Wozny (54) reported on a study by Drott and Mancall where high school students used online bibliographic searching and conventional searching to obtain information for an independent research assignment. Results were surprising in that the online searches resulted in few references in the students' bibliographies, although it appeared that online searching played a key role in meeting the objectives of (1) making students aware of the diversity of institutions and sources that supply information, and (2) providing new opportunities for assisting students in developing search strategies. More investigation into the abilities, attitudes, and approaches of this group of users is needed.

In the future, there will be a myriad of computer and information systems available to a range of users. The research, development, and design projects described in this paper are just a beginning. The goal for information and library professionals remains the same: to put patrons in contact with the information or sources of information

they need as quickly and easily as possible. Online systems directly accessible to non-professional end users will be important tools in their efforts to attain this goal.

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Standards for a User-System Interface Language in Online Retrieval Systems: The Challenge and the Responsibility
 Atherton, Pauline
Online Review, 2, 1, 57-61 Mar 1978
 It is proposed that the conversational language used in interactive retrieval systems should become standard, at least as far as the technical terms and symbols used by the user are concerned. If that effort is successful, a standards effort in the area of a code of practice or recommended methods for operation could be developed. (Author)
- *EJ274713 IR 510808
ASK for Information Retrieval: Part II. Results of a Design Study.
 Belkin, N. J.; And Others
Journal of Documentation, v38 n3 p145-64 Sep 1982
 Reports on methodology and results of design study for an interactive information retrieval system funded by British Library Research and Development Department which will determine structural representations of anomalous states of knowledge (ASKs) underlying information needs. Problem statements, abstracts used, and text analysis are highlighted. References and appendices are provided. (EJS)
- *EJ216494 IR 507734
Education and Training for Computer-Based Reference Services: Review of Training Efforts to Date.
 Bourne, Charles P.; Robinson, Jo
Journal of the American Society for Information Science, v31 n1 p25-35 Jan 1980. Reprint: UMI
 Discusses issues regarding training for computer-based reference services, including who is to be trained and who is responsible for programs. Available training materials service suppliers, database

*An asterisk before a citation indicates that the item also appears in the Reference List.

suppliers, librarians, and users to extend the training, and summarize the training offered to date by searchers also considered. (Author/PM)

- *EJ273024 IR 510868
Can a Standard for an Online Common Command Language Be Developed?

Cochrane, Pauline A.

Online, v7 n1 p36-37 Jan 1983. Reprint: UMI

This working paper from the American National Standards Committee Z-39, Subcommittee G on Standard Terms, Abbreviations and Symbols for Use in Interactive Information Retrieval discusses the issue of standardization for command languages used in interactive online searching of bibliographic databases. (EJS)

- *EJ263441 IR 510087
"Friendly" Catalog Forgives User Errors.

Cochrane, Pauline A.

American Libraries, v13 n5 p303-06 May 1982. Reprint: UMI

Describes the features and operations of a user-searchable online catalog called PaperChase which was developed and implemented for the retrieval of medical literature by physicians at Beth Israel Hospital in Boston. Interaction with the system and use of the catalog during its first year of operation are discussed. (JL)

- ED215683 IR010146
Measurement and Improvement of Subject Specialists Performance Searching Chemical Abstracts Online as Available on SDC Search Systems.

Copeland, Richard F.; And Others

Bethune-Cookman Coll., Daytona Beach, FL.

Jun 1980. 142p.

EDRS Price - MF01/PC06 Plus Postage.

The first phase of a project to design a prompting system to help semi-experienced end users to search Chemical Abstracts online, this study focused on the differences and similarities in the search approaches used by experienced users and those with less expertise. Four online searches on topics solicited from chemistry professors in small colleges--the target group for the prompting system--were conducted by each of the 12 participants, who were divided into three groups on the basis of their prior experience. Each participant received a packet of materials introducing the project, searching, and search aids, and SDC's chemistry manual, and a slide/tape presentation was shown at the time of the test. It was found that,

...the results of the study are presented in a series of tables and charts. The study also includes a series of appendices which contain the questionnaires and the data collected. The study is a valuable contribution to the literature on the use of computers in education and is highly recommended for those interested in the field.

- *EJ225368 IR 50264

End User Education: A Design Study.

Ullas, Arthur W.; And Others

Online Review, v4 n2 p153-6 Jan 1981.

Traces the history of distribution, loan and access control for scientific and technical information; describes the findings of a Biosciences Information Service (BIOSIS) design study of end-user education and training programs in information resources; and presents a planning structure and some scenarios for end-user education. (Author/ID)

- *EJ254661 IR 509561

Is There a Future for the End User in Online Bibliographic Searching?

Fabisoff, Sylvia; Hurych, Jitka

Special Libraries, v72 n4 p347-55 Oct 1981. Reprint: UMI

Examines the probability and necessity of an increase in end-user searching of online databases on library use and library education. The problems of end-user searching are discussed, new developments in online access are reviewed, and recommendations for the education of the end-user are made. Included are 25 references. (LJ)

- *EJ240890 IR 508785

Online Searching: Measures That Discriminate among Users with Different Types of Experiences.

Fenichel, Carol Hansen

Journal of the American Society for Information Science, v32 n1 p23-32 Jan 1981. Reprint: UMI

Describes a study conducted to identify the differences among the searches of users of online systems who have different amounts of overall experience, and the differences between the searches of persons with and without experience on the database being searched. Twenty-five references are cited. (FM)

E128485

IR 511239

A Relational Database System for Student Use.

Fertick, Len

Computers and Education, v6 n3 p295-98 1982

Describes an APL implementation of a relational database system suitable for use in a teaching environment in which database development and database administration are studied, and discusses the functions of the user and the database administrator. An appendix illustrating system operation and a eight-item reference list are attached. (Author/JLE)

*E128493

IR 508596

On-Line Catalogs at the Reference Desk and Beyond.

Ferguson, Douglas

RQ, v29 n1 p7-10 Fall 1985. Reprint: UMI

Briefly reviews the current developments in public access catalogs and poses questions for the public service librarian. (FM)

E1281369

IR 511271

End-User Training in the Use of a Small Swedish Database.

Fjallbrant, Nancy; And Others

College and Research Libraries, v44 n2 p161-67 Mar 1983.

Reprint: UMI

Describes how group of end users (engineering undergraduates) at Chalmers University of Technology were trained to perform interactive online searching on BYGGDOK, a small, specialized Scandinavian database. Goals and objectives of the instruction, teaching methods, evaluation, and comparison of searching between end users and intermediaries are noted. Ten references are provided. (EJS)

*EJ192793

IR 506104

The User--Cordial Interface.

Goldstein, Charles M.; Ford, William H.

On-Line Review, v2 n3 p269-75 Sep 1978

The contradictory nature of the phrase user-oriented interface (UOI) as commonly applied to retrieval systems is discussed, and a different approach to the problem made feasible through improvements in the technology is described. (Author/JPF)

*EJ261367

IR 009 054

Experiences in Training End-User Searchers.

Haines, Judith S.

Online, v6 n6, p14-23 Nov 1982.

Describes study of chemists at the Chemistry Division, Organic Research Laboratory, Eastman Kodak Company, on end-user searchers on the DIALOG system searching primarily the "Chemical Abstracts" database. Training, level of use, online browsing, types of searches, satisfaction, costs, and value of end-user searching are highlighted. Three references are provided. (EJS)

*EJ261369

IR 009 059

Online Catalogs: Coping with the Choices.

Horny, Karen L.

Journal of Academic Librarianship, v8 n1, p14-19 Mar 1982.

Reprint: UMI

Discusses and compares some online catalog systems actually in operation in terms of self-service usability; number, choice, and formulation of access points; record content and display; database content; connections to technical processing and circulation; number and location of terminals; equipment and software features; and cost. (Six references). (RAA)

*ED 195 275

IR 009 054

On-Line Public Access to Library Bibliographic Data Bases: Developments, Issues, and Priorities. Final Report.

Kaske, Neal K.; Ferguson, Douglas

Ohio Coll. Library Center, Columbus.; Research Libraries Group, Branford, Conn.

Sep 1980. 79p.

EDRS Price - MF01/PC04 Plus Postage.

This report describes project activities designed to identify the critical issues and problems in designing and developing library bibliographic retrieval systems for direct patron use. The results of a survey, an issues analysis paper, and a working session indicate four priority areas for study and action: user and use characteristics, interface characteristics, the library environment, and the computing environment. Recommendations made by the working session participants highlight the consensus of their concerns--the analysis of user requirements and behavior, the monitoring of existing public access systems, the development of materials for cost management, and the development of distributed computing and system architecture.

of library users' needs and preferences, and strategies for the improvement of cataloging records using free-text descriptors, or enhancing currently used subject access systems such as Library of Congress Subject Headings, and on ensuring the effectiveness of the user interface with an online catalog is also discussed. Six recommendations are made for the improvement of subject access in online catalogs, and a related reference list is included. (D)

and to be assigned)

An experimental comparison of the effectiveness of computers and humans as search intermediaries.

Marcus, Richard S.

Journal of the American Society for Information Science, v34 n6 p381-403 Nov 1983. Reprint: UMI.

The findings of a study of 16 end users new to CONIT (Connector for Networked Information Transfer), who conducted searches on 20 different topics using the CONIT system and searches on the same topics working with trained human intermediaries searching directly, indicate that experimental intermediary techniques are now capable of providing search assistance whose effectiveness at least approximates that of human intermediaries in some contexts. (BBM)

ED229059

IR 050162

Investigations of Computer-Aided Document Search Strategies.

Marcus, Richard S.

Massachusetts Inst. of Tech., Cambridge. Laboratory for Information and Decision Systems.

1 Sep 1982. 74p.

EDRS Price - MF01/PC93 Plus Postage.

Controlled experiments were conducted with an enhanced experimental intermediary system, CONIT (Connector for Networked Information Transfer), to test how effective such a system could be in assisting end users in online searching of medical and biomedical literature. A total of 16 end users, none of whom had previously operated CONIT or any of the four bibliographic retrieval systems used in the study, performed searches on 20 different topics with no assistance other than that provided by CONIT itself (except to recover from machine and software problems). The same topics were then searched by human expert intermediaries (librarians) with the end users present. Sometimes CONIT and sometimes the human expert were clearly superior in terms of such parameters as recall and search time. In general, however, end users searching alone with CONIT achieved somewhat higher online recall at the expense of

Figure 1 illustrates the architecture of the system. The system is designed to provide information retrieval services to users. It consists of a user interface, a database, and a retrieval engine. The user interface allows users to enter queries and view results. The database stores the retrieved information. The retrieval engine processes the queries and retrieves the relevant information from the database. The system is designed to be flexible and scalable, allowing it to handle a large number of users and queries.

ED014780
Computer Interfaces for User Access to Heterogeneous Information-Retrieval Systems.

Marous, Richard S.; Reintjes, J. Francis.

Massachusetts Inst. of Tech., Cambridge, Ill. Inst. of Systems Lab.
Apr 1977. 83p.

EDRS Price - MF01/PC06 Plus Postage.

A translational computer-interface approach to providing a common, or virtual-system, model of access to a network of heterogeneous online bibliographic retrieval systems has been investigated. Initial access to such systems by end users has been demonstrated through test usage of an experimental interface. A table-driven, rule-based message interpreter that provides a dynamic and flexible means for handling the automation of the interconnection of computer and human retrieval protocols has been found useful in implementing the interface. Experimental analysis has demonstrated the success of various computer-assisted instructional techniques as well as indicated basic tradeoffs and limitations of their implementation in working systems. Further development of interactive systems appears promising and possibilities for further research have been outlined in a number of areas. (Author)

ED090154
Experiments and Analysis on a Computer Interface to an Information-Retrieval Network.

Marous, Richard S.; Reintjes, J. Francis.

Massachusetts Inst. of Tech., Cambridge, Ill. Laboratory for Information and Decision Systems.

Apr 1979. 133p.

EDRS Price - MF01/PC06 Plus Postage.

A primary goal of this project was to develop an interface that would provide direct access for inexperienced users to existing online bibliographic information retrieval networks. The experiment tested

the concept of a virtual system, which is a network of interactive retrieval systems and interfaces. An experimental translating computer interface called CONIT, that enables the virtual-system model, was developed as a research test vehicle. The interface was designed to make the basic functions of three different bibliographic retrieval systems accessible, even by inexperienced end users, by providing a simplified common command language coupled with extensive online instruction. Analysis of controlled experiments with end users indicates the probable success of operational interfaces using the virtual-system principle and other techniques demonstrated in the experimental interface. The research has also suggested that certain techniques implementable on an interface could enhance retrieval effectiveness for a wide class of users by aiding them in the development of search strategies. A project bibliography and references are included. (Author/RAA)

ED125533

IR 593617

The Networking of Interactive Bibliographic Retrieval Systems.

Marcus, Richard S.; Reintjes, J. Francis

Massachusetts Inst. of Tech., Cambridge, Electronic Systems Lab.
Mar 1976. 172p.

EDRS Price - MF01/PC07 Plus Postage

Research in networking of heterogeneous interactive bibliographic retrieval systems is being conducted which centers on the concept of a virtual retrieval system. Such a virtual system would be created through a translating computer interface that would provide access to the different retrieval systems and data bases in a uniform and convenient way, even for the inexperienced user. An experimental interface, called CONIT, has been built to test the virtual system concept. Initial evaluation of CONIT, which connects four retrieval systems, suggests that the virtual system approach could be cost effective. Particular attention was focused on the requirements for a common command language, ease of use, and message interpretation and protocols in a networked interface. (Author/JY)

*EJ248944

IR 599275

A Translating Computer Interface for End-User Operation of Heterogeneous Retrieval Systems. I. Design.

Marcus, Richard S.; Reintjes, J. Francis

Journal of the American Society for Information Science, v. 34 n4
p287-323 Jul 1981. Reprint: UMI

This first of two related articles by the same authors describes the philosophy, design, and implementation of an experimental

Investigating a computer system, the CONIT, whose purpose was to investigate techniques for simplifying access to, and operation of, bibliographic retrieval systems. References are given. (JMI)

*EJ248945 IR519276

A Translating Computer Interface for End-User Operation of Heterogeneous Retrieval Systems. II. Evaluations.

Marcus, Richard S.; Reintjes, L. Francis

Journal of the American Society for Information Science, v33, n4 p354-17 Jul 1981. Reprint: UMI

This second of two related articles by the same authors evaluates the performance of an experimental translating computer system, CONIT, whose purpose was to investigate techniques for simplifying access to, and operation of, bibliographic retrieval systems. Twenty-two references are cited. (JMI)

*EJ258341 IR51114

The Computer as a Search Intermediary.

Meadow, Charles T.

Online, v3 n3 p54-59 Jul 1979

Presents the rationale behind and a description of the Individualized Instruction for Data Access (IIDA) system, which is intended to assist people in performing online bibliographic searches through the use of another computer as intermediary. (CWM)

*EJ271584 IR510740

A Computer Intermediary for Interactive Database Searching. I. Design.

Meadow, Charles T.; And Others

Journal of the American Society for Information Science, v33 n5 p325-32 Sep 1982. Reprint: UMI

Reports on the development of the Individualized Instruction for Data Access System (IIDA), a computer system designed at Drexel University, which serves as an intermediary enabling users to perform complex tasks on another computer. Capabilities of the instruction mode and assistance mode are discussed. Fifteen references are cited. (EJS)

ED214733

ED012876

A Computer Intermediary for Interactive Database Searching. II. Evaluation.

Meadow, Charles T.; And Others

Journal of the American Society for Information Science, v33, n6
p357-64 Nov 1982. Reprint: F33M

Testing in an industrial setting of the Individualized Instruction for Data Access System--an interactive system designed to train and assist users in conducting computer searches--demonstrates that end users can learn to do bibliographic searches through computer-assisted instruction that are as satisfactory as searches performed for them. References are listed. (JIS)

ED219926

IR009834

Individualized Instruction for Data Access (IIDA). Final Report.

Meadow, Charles T.; And Others

Drexel Univ., Philadelphia, Pa. Graduate School of Library
Science; Franklin Inst. Research Labs., Philadelphia, Pa.

22 Oct 1981. 73p.

EDRS Price - MF01/PC03 Plus Postage.

The realization that the facilities available for the retrieval of scientific and technical information were being underutilized resulted in a project being undertaken by the Drexel University School of Library and Information Science to develop a computer intermediary capable of assisting users of scientific and technical information in the performance of online bibliographic searches. Individualized Instruction for Data Access (IIDA), the computer system developed during the project, operates in an instructional and an assistance mode, and can be used to train users to perform online searches or to aid users in search performance. The system employs a set of diagnostics which alert users to the strategic and syntactic errors they make during the search process. When IIDA was operational, a number of evaluations of the system were made, first using undergraduate computer science majors and experienced online searchers, then library science faculty and graduate students and undergraduate engineering students, and finally engineers at the Exxon Research facility in Florham Park, New Jersey. The evaluation studies indicated that individuals who had never done online searching were able, using IIDA, to do searches which produced satisfactory results. Detailed accounts of the design of the system, system operations, and the methodology of the evaluation studies are given, and the project bibliography is included. (JL)

- *EJ258335 IR 507195
Online Searching and Computer Programming: Some Behavioral Similarities (Or...Why End Users Will Eventually Take Over the Terminal).

Meadow, Charles T.

Online, v3 n1 p49-52 Jan 1979

Uses an analogy to computer programming to demonstrate that end user training for online bibliographic search systems will increase, lead to vastly increased use of online search systems, increase the understanding of end users, and reduce the amount of time professionals spend on routine tasks. (CWM)

- EJ264736 IR 510161
The Design of an Interactive Data Retrieval System for Casual Users.

Radhakrishnan, T.; And Others

Information Processing and Management, v18 n1 p23-32 1982

Describes an interactive data retrieval system which was designed and implemented for casual users and which incorporates a user-friendly interface, aids to train beginners in use of the system, versatility in output, and error recovery protocols. A 14-item reference list and two figures illustrating system operation and output are included. (JL)

- *EJ179519 IR 505170
The Probability Ranking Principle in IR.

Robertson, S. E.

Journal of Documentation, 33, 4, 294-304 Dec 1977

Discusses the principle that documents should be ranked in order of the probability of relevance for optimal retrieval. (Author/KP)

- *EJ141605 IR 503603
Relevance Weighting of Search Terms.

Robertson, S. E.; Sparck Jones, K.

Journal of the American Society for Information Science, 27, 3, 129-46 May-Jun 1976

Examines statistical techniques for exploiting relevance information to weight search terms. These techniques are presented as a natural extension of weighting methods using information about the distribution of index terms in documents in general. (Author)

- *EJ274774
Implications of Artificial Intelligence for End User Use of Online Systems.

Smith, Linda .

Online Review, v4 n4 p383-91 Dec 1982.

Reviews several studies which demonstrate how artificial intelligence techniques can be applied in the design of end user-oriented interfaces (which would eliminate the need for an intermediary) to existing online systems, as well as in the development of future generations of online systems intended for the end user. (Author/SW)

- *EJ274781
OL'SAM: An Intelligent Front-End for Bibliographic Information Retrieval.

Toliver, David E.

Information Technology and Libraries, v1 n4 p317-26 Dec 1982.

Reprint: UMI

Discusses intelligent front-end processors designed to impose uniform standards on multiple databases and assist searchers, including motivation for development, prototypes from research community, commercial systems using microcomputers, capabilities and problems encountered in developing Franklin Institute's Online Database Search Assistance Machine (OL'SAM), and recommendations for further development. Sixteen references are cited. (EJS)

- *EJ248933
DIATOM: A DIALOG Simulator.

Waldstein, Robert

Online, v5 n3 p68-72 Jul 1981. Reprint: UMI

Describes DIATOM, an online bibliographic retrieval system designed and implemented at Syracuse University to teach search strategy and the use of DIALOG to library science students. System features and database storage considerations are explained. (FM)

- *EJ271520
Online Bibliographic Searching and Student Use of Information: An Innovative Teaching Approach.

Wozny, Lucy Anne

School Library Media Quarterly, v11 n1 p35-42 Fall 1982.

Reprint: UMI

Provides description of use of libraries and library resources by ninth-grade students trained in online bibliographic searching and

conventional modes of accessing literature. Information is included on student use of types of resources, magazines, libraries, online searching, and student acceptance of direction from library media specialists. Six references are listed. (EJS)

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